

**Notes on the Biology of *Neomachilis halophila*
on a California Sandy Beach**

(Thysanura: Machilidae)

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Neomachilis halophila Silvestri, originally described from beaches near San Francisco, is common under rocks and in crevices in the high intertidal zone on California beaches (W. Evans, pers. comm.). I have found it most abundant just on the seaward side of the last terrestrial vegetation in areas covered with rocks too high on the beach to be disturbed by most high tides, and especially among rocks piled in such a manner that a small space occurs between rock and sand. Little is known of the natural history of this species. The present study deals with population structure, activity rhythm, and food. All observations were carried out near Pacific Grove, California, at sites on Pt. Pinos and on Mussel Point near the Hopkins Marine Station in April and May 1972.

POPULATION STRUCTURE.—Specimens (135) were collected at Pt. Pinos 19 and 20 May. In the laboratory they were anesthetized with ether, sexed, and measured under a dissecting microscope. Females were determined by the presence of the elongate ovipositor extending from the eighth and ninth segments (Lubbock, 1873). Length was measured from the tip of the head to the posterior end of the abdomen, excluding caudal cerci and filament (Fig. 1). Males and females occur in approximately equal numbers. Some females are larger than the largest males. A marked discontinuity in size is seen in the population. Many juveniles, no longer than 3.5 mm, are present, but the next shortest size class begins at 8.1 mm. In a Californian lepismid studied by Lasker (1956), seasonal breeding was reported, eggs being found only in April and May. The discontinuity observed in the present study suggests a similarly limited breeding period in late winter or early spring. The numerous juveniles were found along with the much larger adults.

ACTIVITY PATTERN.—Preliminary observations indicated that *Neomachilis* remained at rest during the day, mainly on undersides of rocks. At night they were more active, and were found crawling on sand beneath rocks and on upper surfaces of rocks. Activity patterns of the

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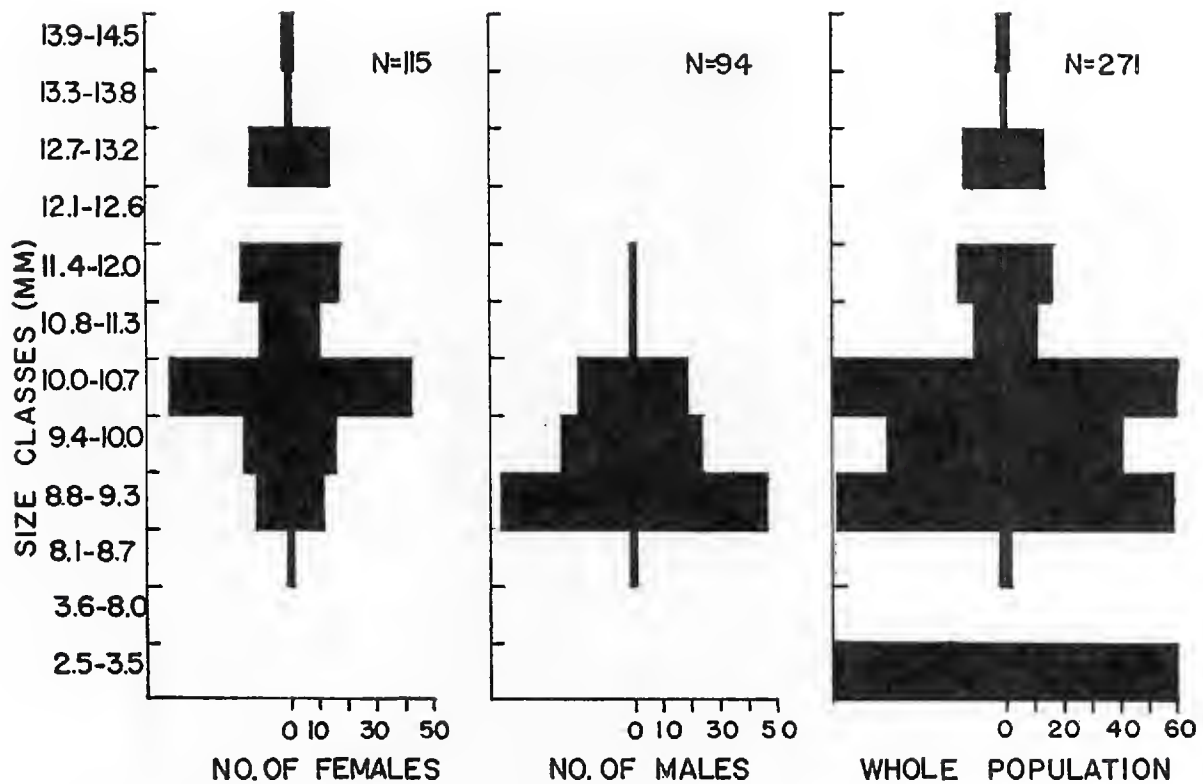


FIG. 1. Population structure of *Neomachilis* at Pacific Grove, California. 19-20 May.

population were determined in two 24-hour periods of regularly repeated field observation, one carried out at Pt. Pinos and the other at Mussel Point. Observations in darkness were made with a red-filtered flashlight. At Pt. Pinos, two areas of about thirty square feet each were marked off and examined every two or three hours for location and number of *Neomachilis*. At Mussel Point one site of approximately thirty square feet was similarly observed. At each observation time animals were categorized as either 1) stationary on undersurfaces of rocks, 2) crawling on sand beneath and around rocks, or 3) crawling on the tops of rocks (Fig. 2). The increase in total number, decrease in number on undersurfaces of rocks, and increase in number on sand and on tops of rocks, all indicate that the activity of *Neomachilis* increases with the coming to darkness, reaches a peak shortly before sunrise, and declines rapidly at dawn (Fig. 2). The early morning activity peak coincides with the period of heaviest dew fall (S. Johnson, pers. comm.).

FOOD AND FEEDING.—Food studies were carried out on animals collected at Pt. Pinos on 25 and 26 May and immediately preserved in 95% alcohol. In the laboratory animals were decapitated and the whole alimentary canal removed as described by Lasker (1956). Intestinal contents were removed, mounted in glycerine, and examined under a

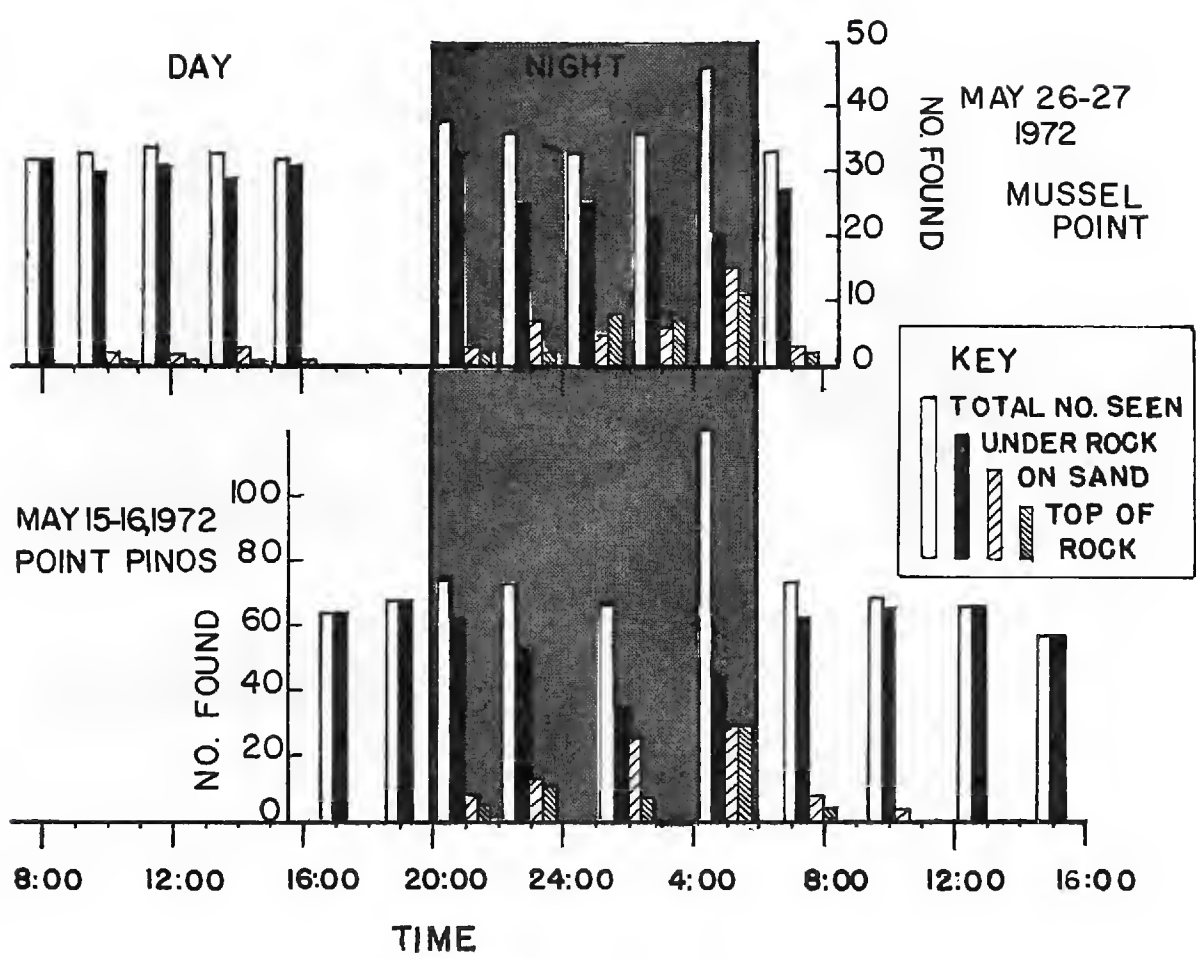


FIG. 2. Activity pattern of *Neomachilis* at Pacific Grove, California.

compound microscope. Major categories of food were determined qualitatively. Six samples of ten animals each were taken over a 16.5 hour period to observe any changes in quantity and nature of the gut contents.

A fair variety of material occurs in the gut of *Neomachilis* with unicellular green algae, yeast, and pine pollen being the materials most often found. The unicellular algae are derived from and encrusting lichen growing on the upper surfaces of the rocks under which *Neomachilis* is found. The probable source of the pollen is the Monterey Pine (*Pinus radiata*), the most abundant tree near Pacific Grove shores, and a species which produces large quantities of wind-borne pollen in late winter and early spring. The source of the yeast is unknown. The other materials found represent common high beach detritus. In 22% of the animals, sporozoans (Gregarinidae) were found in the mid gut, in numbers from two to thirty-six. The largest numbers of animals with guts partly or wholly filled were found in early morning, indicating that feeding tends to occur during periods of greatest activity.

SUMMARY

Neomachilis inhabits the spaces beneath rocks of the upper beach and shore areas just below the land vegetation. Males and females occur in equal numbers, but large females are larger than large males. Activity is largely nocturnal, and greatest activity occurs just before dawn. Common foods include unicellular green algae (from lichens), yeast, pine pollen, and vegetable detritus. Most feeding occurs during the pre-dawn period of greatest activity.

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RECENT LITERATURE

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